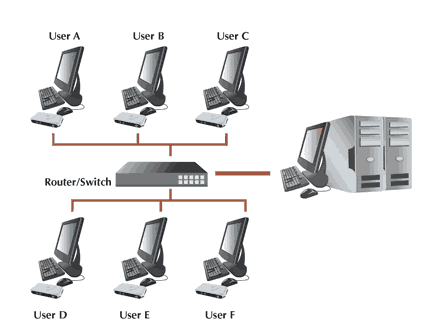
**Name:Tharaga Srithavan Date:14/08/12**

**Task 2 - Theory Assessment**

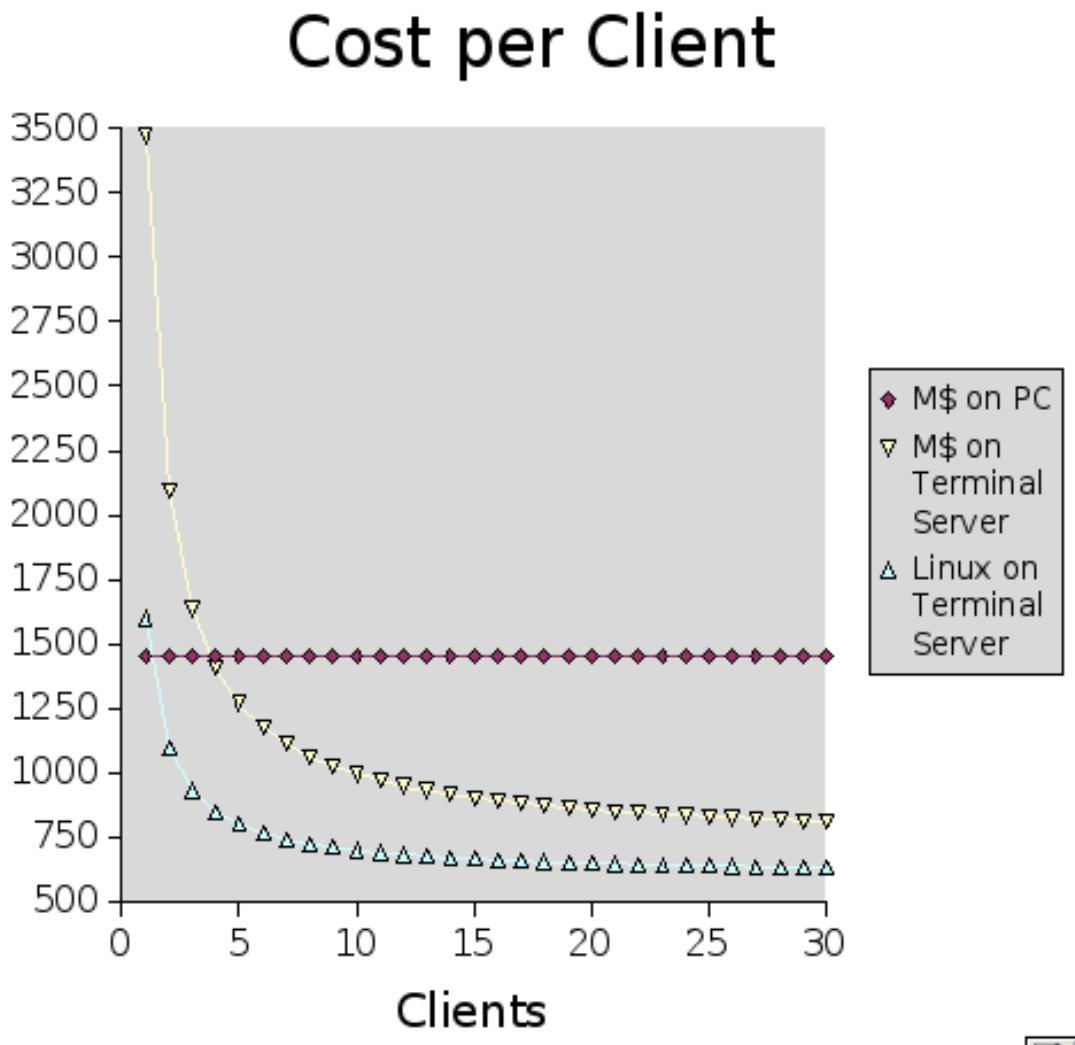
**Research and identify suitable technology solutions applicable to the project**

**Gather power consumption data on ICT equipment required for an energy audit based on an agreed standard**

**Thin Client Networks**



<http://www.ikon.is/ikon/content/view/114/52/lang,english/>



**Thin Client**

<http://en.wikipedia.org/wiki/Thin_client>

<http://www.lamarheller.com/technology/thinclient/powerstudy.pdf>

<http://net.educause.edu/ir/library/pdf/DEC0005.pdf>

A thin client (sometimes also called a lean or slim client) is a computer or a computer program which depends heavily on some other computer (its server) to fulfill its traditional computational roles. This stands in contrast to the traditional fat client, a computer designed to take on these roles by itself. The exact roles assumed by the server may vary, from providing data persistence (for example, for diskless nodes) to actual information processing on the client's behalf.

Thin clients occur as components of a broader computer infrastructure, where many clients share their computations with the same server. As such, thin client infrastructures can be viewed as the providing of some computing service via several user-interfaces.

Thin-client computing is also a way of easily maintaining computational services at a reduced total cost of ownership.

Name: Date:

**Theory (50Marks)**

Complete the following:

Questions (5 marks each)

1. Give an overview of thin client computing to your client.

ANSWER:

Instead of running applications locally on PCs with all of their associated challenges and costs, applications run centrally with only keyboard, video and mouse (KVM) updates transmitted across the network. Bandwidth usage is minimal compared to traditional PC/server environments, with wireless LAN being ideal for the clients. The server backbone linking the terminal servers, data servers, mail servers, and so on is the only LAN connection that needs high capacity.

1. Explain the advantages of a thin client.

ANSWER:

Thin client usage results in lower administrative costs and greater security. Since all processing occurs on a server and is centrally managed, the local environment is stateless and the hardware has fewer points of contact with processing activity resulting in a lower probability of error.

In stateless environments software programs do not retain data or configuration settings between processes. The World Wide Web that uses HTTP is the most dominating stateless environment. Once a process is completed and a web page is delivered, the connection is closed. Cookies help counter this.

Stateless environments also protect against malware, which is software designed to damage a system without the user’s consent or knowledge. They are essentially the same thing as viruses, but can include worms and spyware, to name just a few examples. Thin clients are protected against malware since no application data exists on the server; it is all centrally managed on the server. Thin clients also reduce hardware costs by not requiring disks or supporting application memory. They also don’t require updating as regularly or become obsolete as quickly. Hardware is also better utilized in thin clients. Thin clients can share memory, while CPUs remain idle. Several users can run the same program simultaneously, but the program only needs to be loaded once with a central server.

Thin client servers use less bandwidth, which also reduces costs. Since most terminal servers exist on the same network as file servers, network traffic mostly occurs in the server. Thin clients use resources more efficiently. They only use the minimal resources to accomplish a requested task. Finally, thin clients make it easy to add resources, as they are needed. Thin clients make upgrading easier and more efficient as well.

1. Explain the disadvantages of thin client.

ANSWER:

Thin client servers require a high performance level, since this is where the bulk of processing takes place. In contrast, thick clients perform much of their own processing on their end before sending it to servers. Therefore, thin clients make servers expensive and complicated.

Thin clients do not support multimedia-rich applications, like video gaming. Multimedia-rich applications require a significant amount of bandwidth to function to their maximum potential. Thin clients’ use of relatively little bandwidth mean that animation; video, and other graphic features are not well supported in this environment. For example, thin clients are often overwhelmed and stop working when they are required to stream media or use Flash players.

Operating systems like Windows are designed to run on local resources. This actually makes them less flexible, in direct contradiction to it proposed goals. Since thin clients run on remote resources it may be difficult to run these systems on thin client-server networks. High latency networks, where the lag time in transferring data over a network is long, can make thin clients unusable. If a network is down, there is no way for a thin client to access the server and processing power it needs to respond to requests.

Thin clients make it difficult to track individual user behavior, which is often analyzed to provide more customized responses to frequently asked requests and predict future user behavior for more efficient use of resources. Finally, thin clients create server-side bottleneck and scalability issues.

1. Explain alternative ways to setup thin client networks in GNU/Linux

ANSWER:

Diskless Remote Boot in Linux (DRBL)

A less known alternative to LTSP is Diskless Remote Boot in Linux (DRBL) from the NCHC Free Software Labs in Taiwan. DRBL is free software and can be installed on almost any distribution of GNU/Linux, including Debian, Ubuntu, Mandriva, Red Hat, Fedora, CentOS and SuSE. Many consider DRBL to be better than LTSP because it allows for distributed hardware resources between the server and the clients. In other words, DRBL can share the RAM between the server and the clients and utilize the client's harddrive for server swap space. Moreover, DRBL is able to fully detect the local hardware of the clients, so it doesn't require complicated fiddling to use local drives like LTSP. DRBL also includes Clonezilla, a partitioning and disk cloning utility similar to Symantec Ghost. Therefore DRBL is an excellent option for thin client networks which need to be returned to their previous state. For instance, an administer of a cyber-cafe or school lab who wants revert all the computers in the network to their original format each morning might want to use DRBL with Clonezilla. Unfortunately, DRBL is less supported and doesn't have any GNU/Linux distributions like Edubuntu, Skolelinux and K12LTSP which are specifically designed around it. Nor does it have a companies like Canonical, Symbio Technology and DisklessWorkstation.com supporting its development or offering tech support.

2X TerminalServer

2X TerminalServer is an attractive alternative to LTSP and DRBL for people who want more polished software with a nice graphical administration tools and a user-friendly setup. Like LTSP and DRBL, 2X TerminalServer is free software for creating GNU/Linux networks with X-Windows thin clients, but it offers graphical management tools to administer the terminal server remotely from any web browser. By default 2X TerminalServer uses the NX protocol, which compresses and encrypts standard X-Windows video so it can reduce the network load and create Wide Area Networks (WANs) which function over phone lines and low-bandwidth connections. NX compression can also be enabled in DRBS and LTSP, but it isn't included by default and is more difficult to implement. Like LTSP 5.0, 2X TerminalServer tunnels all communication to the clients through SSH for greater security. 2X TerminalServer can be used in mixed environment networks as well, since it can translate and tunnel Microsoft's RDP, Citrix's ICA, and the VNC protocols to the clients.

TerminalServer is developed by 2X, an innovative company which originally started as the PXES free software project to create diskless thin clients. It proved to be such a popular program, that its founder decided to start the company 2X to commercialize thin client software. 2X has since created a number of proprietary products to compete with Citrix, Microsoft and ThinSoft. 2X encourages people who don't need tech support to use TerminalServer for gratis, but also offers tech support contracts for customers who need more handholding and user assistance.

2X TerminalServer can be used in disked thin clients, but it also works in diskless thin clients, since it has incorporated the old free software project PXES into TerminalServer. Like Thinstation, PXES was based upon the old Netstation project and boots up diskless clients by transferring a basic operating system over the network to the client. 2X TerminalServices (with PXES incorporated) is better packaged and the graphical startup screen is nicer than the scrolling bare text on the startup of Thinstation and LTSP. It is probably better in corporate environments where appearance is crucial, but it requires that the client machines have at least 32MB RAM. For this reason, it is not recommended that 2X TerminalServer be used with extremely old hardware like LTSP.

Thinstation

Thinstation is a free software project based upon the now-defunct netstation project, which creates diskless clients in almost any type of thin client network. Like LTSP and DRBL, Thinstation transfers a basic GNU/Linux operating system over the network and loads it into the RAM of the clients. LTSP and DRBL, however, include a terminal server, whereas Thinstation simply displays terminals from almost any type of terminal server. It can handle Microsoft's RDP, Citrix's ICA, X (X-Windows protocol), NX (compressed X-Windows protocol), 2X ThinClient, Cendio ThinLinc, Tarantella, VNC, telnet, tn5250, VMS term, and SSH protocols. Thinstation's flexibility allows diskless thin clients to be setup in almost any kind of network. Many network administrators turn to Thinstation when they want to setup Windows terminals, but they don't want to pay for expensive operating system licenses on the client machines. Using diskless thin clients saves on hardware costs, since there are no harddrives, CD-ROMs, or floppy drives to buy. Since there are no moving parts, there are are few hardware failures (which become increasingly common with older machinery). Most importantly, there are no operating systems on the harddrives of the client computers to worry about, freeing up the network administrator for more important tasks.

VNC

Sometimes it is necessary to access another computer on the network. There are a number of options for creating this type of hybrid client which can use the local operating system, but can also access the resources of another computer. Many network administrators who want to remotely control another computer install a graphical desktop sharing program such as VNC (Virtual Network Computing) or tightVNC. This program transmits the keyboard and mouse events from a remote computer to a host computer, then relays screen updates back over the network. VNC runs on almost all platforms including Windows, UNIX and Mac, and is very useful when trying to connect to another type of computer. For instance, many network administrators on Windows machines, use VNC to remotely control a GNU/Linux server.

VNC for Windows is designed for one computer to remotely access another computer, rather than creating a whole network of thin clients. VNC on UNIX or GNU/Linux, however, can initiate multiple desktop sessions, so that it can be used to create a thin client network. VNC can't bootup diskless thin clients (although it might be possible to run VNC inside a diskless client).

rdesktop

rdesktop, which stands for “remote desktop”, displays Microsoft's RDP protocol on a UNIX or GNU/Linux machine. rdesktop allows GNU/Linux clients to use the Terminal Services from a machine running Windows Server NT 4.0/2000/2003. rdesktop is extremely useful in mixed networks where GNU/Linux and Windows clients have to share a network. Some network administrators who want to save on licensing costs also use rdesktop on GNU/Linux clients, so that they can use buy expensive Microsoft Windows operating system licenses for each client. As an added benefit, they don't have to worry as much about managing the clients, since GNU/Linux machines rarely acquire virus, spyware, and malware. They rarely become misconfigured and users can't install unwanted software as easily as on a Windows client. Typically rdesktop is used in clients which have a local operating system installed on their harddrive, but rdesktop it can also be used with diskless clients. Thinstation and 2X have incorporated rdesktop into their software, and rdesktop can be run on a thin client network with LTSP or DRBL.

1. Recommend a Linux thin client solution for a small school classroom of 16 seats (clients)

ANSWER:

With a class of 16 seats an affordable, easily maintainable solution is a thin client option. A single Linux server will house all the software and each of the thin clients will be connected in an Ethernet configuration via a main 24 port switch. With each thin client costing $429 and a server worth approx. $1200 means that with free software and a 24 port PoE switch at around $430 than the entire package can be put together for about $8500. This does not cover the cabling costs as you will require some fixed point data ports to be installed in the room as required.

1. Sketch your solution

ANSWER:



16 ultra thin clients

Internet

Router

Switch



Server



Printer

1. Detail hardware:

ANSWER:

|  |  |  |
| --- | --- | --- |
| Item | Cost | URL |
| DELL PowerEdge T310 SERVER | $1211 | http://www.ebay.com.au/itm/DELL-PowerEdge-T310-SERVER-8GB-RAM-3TB-3x1TB-RAID-2-4GHz-Xeon-Quad-X3430-NEW-/110928686679?pt=COMP\_EN\_Servers&hash=item19d3dd6e57 |
| Cisco SF 200-24P 24-Port 10/100 PoE (SLM224PT-AU) | $430 | http://www.warcom.com.au/products/24607\_cisco\_sf\_200-24p\_24-port\_10100\_poe\_slm224pt-au?PHPSESSID=8a1fdcebb8f306b709b4c03fcd34ddca |
| HP t410 All-in-One | $429 x 16 = $6864 | http://www.itpro.co.uk/640534/hp-t410-all-in-one-thin-client-review-first-look |
| Cabling | To be Quoted |  |
| TOTAL COST | $8505 |  |

1. Detail software:

ANSWER:

|  |  |  |
| --- | --- | --- |
| Item | Cost | URL |
| Open Office | n/a | www.openoffice.org |
| Edubuntu (Package) | n/a | www.edubuntu.org |
| **TOTAL COST** |  |  |

1. What is the expected performance of your solution?

ANSWER:

Client boot time: Approx 2 minutes

Office apps installed: Calc – Draw – Spreadsheet – Writer - Impress

Operational Issues: Network only runs at 100Mb while using PoE

1. Explain the sustainability merits of thin client architectures

ANSWER

Features: With low power usage (13 watts) the ongoing costs will be much cheaper than a desktop PC (Approx 100 watts). The HP t410 does not require a power point as the power is supplied over the Ethernet cable and being an all-in-one unit with an 18.5 inch screen will make this a very workable option.

Advantages: All-in-one unit with an 18.5 inch screen. A power consumption of only 13 watts, which includes the screen. No power cables required as the unit supports Power over Ethernet.

Disadvantages: If power over Ethernet is used then only 100Mb Ethernet is available to the thin clients.

**Practicum (50Marks)**

* **Identify power consumption of a thin client system under different operating conditions using the Current Cost EnviR Energy Monitor and appropriate power lead or similar energy meter.**
* **Recommendations on upgrading computer system.**

1. Record power consumption and notes e.g. range, variability, operating conditions:

|  |  |  |
| --- | --- | --- |
| **Condition** | **Server power consumption**  **(watts)**  **(Ferrari)** | **Thin Client**  **consumption**  **(watts)**  **Model:Y210** |
| **OFF** | 3.1 | 1 |
| **MAX BOOT** | 30 | 5 |
| **IDLE** | 22 | 5 |
| **Wordprocessing** | 24 | 5 |
| **Spreadsheets** | 24 | 5 |
| **Web browsing**  <http://news.bbc.co.uk/2/hi/programmes/click_online/default.stm> | N/A | N/A |
| **Low level music**  [http://grooveshark.com/#/s/Fall+At+Your+Feet/3KIZB0?src=5](http://grooveshark.com/) | N/A | N/A |
| **Low level video** <http://news.bbc.co.uk/2/hi/programmes/click_online/8610962.stm> | N/A | N/A |
|  |  |  |

1. Evaluate the extent to which sustainability could be integrated into an upgrade of the computer system.

Total power draw for a 20 seat thin client system:

(Show your calculations)

20 Y100 units use 66 watts of power (20 x 3.3 watts) during a typical excel training session along with 420 watts for the monitors (20 x 21 watts) that’s a total of 66+420=486 watts of power for the machines factor in 11 watts for a network switch and 24 watts for the server a typical 20 seat thin client would use around 521 watts of power.

Total power draw for a 20 seat PC system:

20 Desktop PC use (20 x 24 watts) 480 watts of power during a typical excel training session along with another (20 x 21 watts) 420 watts of power for the screens giving the machine alone 900 watts of power usage for the training session. Note that’s if a network was not required if it was we would have to add an additional 11 watts for the switch and perhaps another 24 watts for a server making the exercise even more power costly at 935 watts.

Advise your recommendations:

For training 20 people on excel it’s not hard the see the benefits of using a thin client option. The cost savings in power usage would soon add up. At almost double the power requirements a desktop setup would cost more in the setup costs of the machines and would cost more money to run as it uses more power. Whereas a thin client system is typically cheaper to initially setup and will continue to save money by simply requiring less power to operate.